Isotopic data from the Pomarinho enclave swarm (SW Iberian Chain)

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Mafic microgranular enclaves are a common feature of calc-alkaline granitoids (e.g. tonalites and granodiorites) in active continental margins and collisional orogens. They correspond to dark-coloured globules that, although widespread throughout the host rock, usually constitute only a small proportion of the whole volume of the intrusion. When the enclaves occur strongly concentrated in a restricted area, they form an enclave swarm (e.g. [3]). At Pomarinho, the Granialpa quarry is a privileged exposure of a cluster of dark igneous enclaves that has been targeted for geochemical and geophysical studies (GeoRadar and AMS).

The Pomarinho swarm is located in the SW edge of Évora granitoid (Carvalhosa, 1983), in the Portuguese sector of the Ossa-Morena Zone (Iberian Variscides). The enclaves have tonalitic and granodioritic compositions, whereas the host correspond to a very homogeneous light-coloured granodiorite. Preliminary geochemical information, based on major and trace elements [2], suggests that the enclaves and the host rock are probably derived from co-genetic magmas.

Rb-Sr isotope data now obtained in four enclaves and three host-rock samples yield an isochron corresponding to 335±14Ma (MSWD=0.96), which fits into the spectrum of ages of the Variscan granitoids in the region. Additionally, the homogeneity of both $^{87}Sr/^{86}Sr_{335}$ (0.704758 to 0.705133) and εNd_{335} (-0.10 to 1.13) values corroborates the hypothesis of derivation of the enclaves and the host granodiorite from a common primitive melt through magmatic differentiation. Low $^{87}Sr/^{86}Sr_{335}$ and high εNd_{335} values suggest that ultimately the parental melt is related to a mantle source, with no or only small contribution of metasedimentary crustal materials.

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The ca. 4.2-3.7 Ga history of the Acasta Gneiss Complex (Northwest Territories, Canada)

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Compiled U-Pb zircon ages of the oldest components of the Acasta Gneiss Complex (AGC) on the western margin of the Archean Slave Province [1] span 4.05-3.90 Ga [2-5]; even older (4.2 Ga) ages [2, 3] have also been noted. AGC outcrops cover a large (>50 km) area across several domal basement antiforms, but only a small subset of these is documented. We report ion microprobe conventional 2-D spot and 3-D depth-profile geochronology coupled with whole-rock (WR) and zircon REE and Ti thermometry, in petrographic thin sections and from mineral separates, of a diverse suite of AGC lithologies including orthogneisses and gabbroic hornblende schist enclaves. Samples were collected from photo-mapped outcrops (1:25) to guide sampling. Discrete cm-scale gneissic domains show distinctive $[Th/U]_{zirc}$ vs. $[Ti]_{zirc}$ temperatures correlative with zircon U-Pb ages and rock compositions. We used lattice-strain theory to model zircon/WR REE of zircon domains (cores/rims) in different generations of gneisses and relate these to ages of original igneous emplacement and subsequent polyphase metamorphic histories. We confirm that the earliest geological history of the AGC is at 4.2 Ga, followed by magmatic incursions at mid-crustal depths (4.05-4.02 Ga) and thermal modifications at 3.96-3.85 Ga concurrent with some lunar basin formation ages. Eoarchean AGC ages (3.74-3.72) are also preserved, contemporaneous with documented emplacement times for the 3.85-3.71 Ga Itsaq Gneiss Complex in West Greenland [6] and 3.78-3.75 Ga Nuvvuagittuq belt in northern Québec [7].

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